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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/821,473	03/29/2001	Shunpei Yamazaki	SEL-137 DIV	5476

7590 08/04/2003

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EXAMINER

LEE, HSIEN MING

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 08/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/821,473

Applicant(s)

YAMAZAKI ET AL.

Examiner

Hsien-Ming Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 May 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 47-53 and 56-79 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 47-53 and 56-79 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 17.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Remarks

1. Claims 47-53 and 56-79 are pending in the application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 47, 49, 51-53, 56, 57, 59 and 60 are rejected under 35 U.S.C. 102(e) as being anticipated by Jinno et al. (US 2002/0072157).

In re claims 47, 51-53, 56, 59 and 60, Jinno et al. in Figs. 2A-2G and related text expressly and inherently teach the claimed method of fabricating an EL display device, said method comprising the steps of:

- forming a gate wiring (11) on an insulating surface (10);
- forming a gate insulating film (12) and an amorphous semiconductor film (13a) into a laminate sequentially without exposing them to an atmosphere (i.e. are formed in a same chamber, section [0012]) on the gate wiring (11);
- irradiating the amorphous semiconductor film (13a) with an ultraviolet light (ELA, an excimer laser annealing) to crystallize the amorphous semiconductor film (13a) into a crystalline semiconductor film (13) and to form an oxide film at a same time (i.e. the

oxide film would be formed on the surface of the semiconductor film while
subjecting the semiconductor film to the excimer laser);

- covering a first portion of the crystalline semiconductor film (channel 25) with a first mask (14);
- providing an impurity element (P, which is a trivalent impurity) into second portions of the crystalline semiconductor film (i.e. portions of the crystalline semiconductor film 13 except the channel portion 25) at a first concentration (N-) through the oxide film using the first mask (14);
- providing the impurity element (P) into third portions of the crystalline semiconductor film (13S and 13D) at a second concentration (N+) through the oxide film using a second mask (30), wherein the second concentration (N+) is higher than the first concentration (N-), wherein the first portion of the crystalline semiconductor film (25) is a channel forming region while the third portions of the crystalline semiconductor film are source (13S) and drain (13D) regions, wherein fourth portions of the crystalline semiconductor film (13LD) which are not provided with the impurity at the second concentration (N+) but only the first concentration are low concentration impurity regions (N-); and wherein the fourth portions (13LD) are located between the first portion (25) and the third portions (13S and 13D).

In re claims 49 and 57, Jinno et al also teach a step of forming a silicon nitride film before forming the gate insulating film (section [0012]).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jinno et al. (US '157) in view of Miyasaka (US 6,017,779).

Jinno et al. substantially teach the claimed method as stated above except reducing contaminants on a surface of the gate insulating film by active hydrogen or hydrogen compound before forming the amorphous semiconductor film.

However, Miyasaka, in an analogous art of forming the TFT, teaches utilizing the active hydrogen generated by hydrogen plasma to react with contaminants from the insulating film (i.e. an insulating underlevel protection layer, col. 3, lines 59-60) to improve the insulating film surface property prior to forming an amorphous semiconductor film (i.e. a semiconductor film, col. 4, lines 4-5) (col. 22, line 64 through col. 23, line 4 and col. 23, lines 30-34).

Therefore, one of the ordinary skill in the art, at the time the invention was made, would have been motivated to utilize the active hydrogen to reduce contaminants on the insulating film prior to forming the amorphous film, as taught by Miyasaka, to pretreat the surface of the gate insulating film of Jinno et al., since by doing so it would improve the surface property of the gate insulating film, which, in turn, would be beneficial to the subsequent formation of the amorphous film.

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6. Claims 50 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jinno et al. (US '157) in view of Kim et al. (US 6,462,798).

Jinno et al. substantially teach the claimed method as stated above except forming a laminate film including BCB (benzocyclobutene) as a part of the gate insulating film.

However, Kim et al. in an analogous art of forming the TFT teach that the BCB has been used as the part of the gate insulating film in TFT application for the purpose of lowering the dielectric constant of the gate insulating film. (col.4, lines 49-55)

Therefore, one of the ordinary in the art, at the time the invention was made, would have been motivated to include the BCB as taught by Kim et al. as the part of the gate insulating film of Jinno et al. since by this manner it would improve the dielectric property of the gate insulating film. (col.4, lines 49-55, Kim et al.)

7. Claims 61, 62, 64-69, 71-76, 78 and 79 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jinno et al. (US '157) in view of Makita et al. (US 5,851,860).

In re claims 61, 64-68, 71-75, 78 and 79, Jinno et al. substantially teach the claimed method as stated above except using rapid thermal annealing (RTA) or light for crystallizing the amorphous semiconductor film (a-Si).

However, Makita et al. in an analogous art of forming the TFT teach that the excimer laser, RTA and intense light have been widely used in crystallizing the amorphous semiconductor film for obtaining the same satisfactory results, wherein the intense light is either a laser or irradiated by RTA (col.21, lines 19-44).

Therefore, one of the ordinary in the art, at the time the invention was made, would have been motivated to substitute the excimer laser of Jinno et al. with the RTA or light as taught by

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Makita et al since the laser, RTA and light are art-recognized equivalence for crystallizing the amorphous semiconductor film with the benefit of obtaining satisfactory interface characteristics between the semiconductor film and the gate insulating film. (col.21, lines 31-39, Makita et al.)

In re claims 62, 69 and 76, Jinno et al in view of Makita et al also teach a step of forming a silicon nitride film before forming the gate insulating film (section [0012], Jinno et al.).

8. Claims 63, 70 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jinno et al. (US '157) in view of Makita et al. (US '860) as applied to claims 61, 62, 64-69, 71-76, 78 and 79 above, and further in view of Kim et al. (US '798).

Jinno et al. in view of Makita et al substantially teach the claimed method as stated above except forming a laminate film including BCB (benzocyclobutene) as a part of the gate insulating film.

However, Kim et al. in an analogous art of forming the TFT teach that the BCB has been used as the part of the gate insulating film in TFT application for the purpose of lowering the dielectric constant of the gate insulating film. (col.4, lines 49-55)

Therefore, one of the ordinary in the art, at the time the invention was made, would have been motivated to include the BCB as taught by Kim et al. as the part of the gate insulating film of Jinno et al. since by this manner it would improve the dielectric property of the gate insulating film. (col.4, lines 49-55, Kim et al.)

Response to Arguments

9. Applicant's arguments filed 5/30/03 have been fully considered but they are not persuasive for reasons as follow.

Applicants argue that Jinno et al. do not disclose or suggest that an oxide is formed at a same time as the irradiation of the amorphous semiconductor film.” (second paragraph, page 2).

In response to the argument, Jinno et al. do inherently teach the formation of a SiO₂ film (lines 1-2 of paragraph [0044]) on the polysilicon film as subjecting the amorphous semiconductor film to the irradiation for crystallization purpose (paragraphs [0043]~[0044]).

Although Jinno et al. do not expressly teach that the formation is at the same time as the irradiation, it is an inherent consequence of the process, since both Jinno and the instant invention utilize same process (i.e. ultraviolet light irradiation) to treat the same material (i.e. amorphous silicon). Similar process can reasonably be expected to yield product which inherently have the same properties. *In re Spada* 15 USPQ2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 1950).

Applicants further argue that Jinno et al do not teach providing an impurity element into second portions of the crystalline semiconductor film through the oxide film because Jinno et al. teach the impurity is directly introduced into portions of the semiconductor film without passing through the silicon oxide film as shown in Fig.1. (fourth paragraph, page 2)

In response to the argument, it is submitted that the rejection is based on teachings as illustrated in Figs. 2A-2G, not Fig.1 as asserted. In Figs. 2A-2G and related text, Jinno et al. do teach the aforementioned step, as stated previously.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee
Examiner
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July 31, 2003